

SOMETHING ABOUT INDUCTION

What is induction melting?

Induction melting is a method by which electrically conducting materials (generally metals), are heated by a non-contact method in an alternating magnetic field.

What are the most common applications for induction heating?

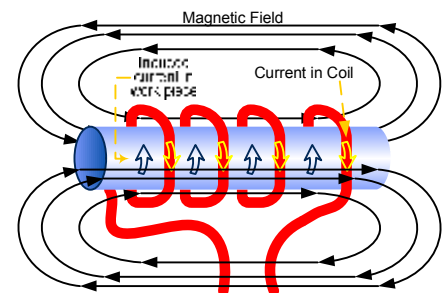
Few of the most common applications where induction is used are Heat treatment of metals - induction hardening, induction tempering, and induction annealing. Induction heating applications prior to deformation are - forging, swaging, upsetting, bending and piercing.

Other applications are Induction brazing and induction soldering - brazing of steel, brass, and copper to each other in combination and aluminum to aluminum. Shrink fitting applications - In any manufacturing process, for example, shrink fitting of motor rotors to shafts, shrink fitting of shell casings for compressors. Induction heating prior to coating of dissimilar metals, prior to insulation, and curing, such as paint.

Induction melting - Of all types and amounts of metals and precious metals. Other applications include crystal growing, cap sealing, sintering, carbon vapor deposition, levitation, exit axial deposition, and plasma generation.

Basically how does induction heating work?

Induction heating occurs when an electrically conducting object (generally metal) is placed in a varying electric magnetic field. Induction heating occurs due to the magnetic quality and resistivity of the material. The magnetic qualities are only present in magnetic steel. The varying electric magnetic field induces a current inside the component being heated in a similar way to that of a transformer.



A source of high frequency electricity is used to drive a large alternating current through a coil. This coil is known as the work coil. **See the picture opposite.**

The passage of current through this coil generates a very intense and rapidly changing magnetic field in the space within the work coil. The work piece to be heated is placed within this intense alternating magnetic field.

What makes up a typical induction melting system?

A typical induction melting system consists of the induction power supply, an induction melting coil, and a water-cooling source, which cools the coil and several internal components inside the power supply. The induction power supply sends alternating current through the induction coil, thus generating a magnetic field. When a metal is introduced within the coil and enters the magnetic field, eddy currents are induced within the metal, generating precise and localized heat without any physical contact between the induction coil and the metal and hence the repetitive induction of eddy current results in melting of metal and this process is called "Induction".

What is an induction coil?

The varying magnetic field required for induction melting is developed in the induction coil via the flow of AC (alternating current) in it. The coil can be made in many shapes and sizes to custom fit a specific application. The coils can range from tiny coils made of copper tubing used for precise heating of extremely small parts in applications such as soldering and ferrule heating to large coil assemblies of copper tubing used in applications such as strip metal brazing and pipe soldering.

What is the importance of the induction coil?

The induction coil is one of the important aspects of an induction system designing. The coil is a custom design to give your work piece or part the proper heating pattern, maximize efficiency of the induction heating power supply's load matching system, and to accomplish these tasks while still permitting ease of loading and unloading your part.

How can my process benefit from induction melting?

Induction melting can benefit your process in a number of ways. Induction melting is highly repetitive once initial settings are made to the Induction power supply. Following this phase, part after part can be heated with identical results so long as the metal is introduced to the coil similarly each cycle. This can also lead to better material utilization and product yield. Induction melting can reduce or eliminate the metal losses, burning losses (Wastages). The ability of induction heating to heat all parts identically lends itself to automation of the process which results in homogeneous mixing of alloys.

Why induction melting equipment is superior compared to other melting sources?

In addition to some of the points mentioned in the previous question, induction melting is also a clean form of melting which does not emit unpleasant odor or heat. Because the current is induced directly into the metal being melted, there is no dejected melting effect into a facilities ambient environment. Induction heating equipment is instantly on which means it requires no initial warm-up time as other conventional heating sources do. Induction heating systems are extremely energy efficient, power saving and environment friendly.

What are some of the other advantages to using Induction melting?

Fast Cycle Times – With induction melting technology, heat is produced instantly and directly within the metal being melted. Thus heat can be supplied as quickly as a material will permit it, eliminating typical soak times associated with radiation or convection heat technologies.

Consistent and Repeatable - Due to the development of Solid-State power supplies, the heating pattern produced by a given induction coil will be consistent from day to day, month to month. Since the induction coil is not in any contact with the metal being melted and the metal is being presented to the coil in a consistent fashion, the process will remain repeatable, unlike traditional flame heating or resistance heating, which have constantly changing characteristics.

Space Requirements and Efficiency - Due to the smaller space requirements for induction melting over many traditional melting methods, this technology lends itself to bench top/work cell environments and in-line semi or fully automated processes. In addition Induction melting technology is energy efficient; power consumption to create the output

power is minimal and in idle or stand-by conditions power consumption is greatly reduced since the power is only on when the system is being utilized for the intended process.

Environmentally Friendly - Induction melting is an extremely clean melting process. It does not produce harmful emissions or loud noise. It does not heat the environment or area outside the work coil unlike many conventional methods, since the heat is only generated in the metal being melted, thus induction melting aids in creating more favorable working conditions.

If I have an application that I feel can utilize induction heating who should I contact?

Any company that can provide reliable induction heating equipment may be able to help you. METRO would appreciate that you contact us through our e-mail address below or ask for the application development form. METRO also has checklists for specific applications which can be completed and e-mailed or faxed to us so that we can provide a fast response.

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